

A field guide to the fiddler crabs of East Point Reserve, Darwin, Northern Territory

Isobel Booksmythe, Tanya Detto and Patrica R. Y. Backwell

School of Botany and Zoology, The Australian National University,
Canberra, ACT 0200. Email: pat.backwell@anu.edu.au

Introduction

Fiddler crabs (genus *Uca*) are small decapod crustaceans inhabiting intertidal mudflats and mangroves. They live in individual burrows in the substrate, into which they retreat to avoid predators and the incoming tide. Around its burrow each crab defends a small territory, in which it feeds by filtering microscopic organisms from the mud. Males are characterised by the great enlargement and modification of one feeding claw (the 'major claw' or cheliped), which is often conspicuously coloured and is used in aggressive encounters and mate attraction (Crane 1975).

Sixteen species of fiddler crab occur in Australia, nine of which are found in Darwin: *U. capricornis*, *U. elegans*, *U. flammula*, *U. hirsutimanus*, *U. mjoebergi*, *U. polita*, *U. seismella*, *U. signata* and *U. dampieri* (von Hagen & Jones 1989). Recent genetic analysis found that individuals described as *U. dampieri* by von Hagen and Jones (1989) are genetically indistinguishable from an east coast species, *U. vomeris* (Keogh & Backwell, unpubl.). We therefore correct the designation of *U. dampieri* in Darwin to *U. vomeris*.

All nine Darwin species can be found along the coast at East Point Reserve, where the habitat conditions preferred by each species can be found in a few different locations (Figure 1). Individual species occur in fairly discrete patches, largely influenced by elevation in the intertidal zone.

Here we present a basic description of each species to assist in identification in the field, based on our extensive behavioural and ecological field observations. Descriptions are arranged roughly in order of size, with the largest reported male carapace width (CW) and major claw (MC) sizes in millimetres provided where available (Crane 1975; George & Jones 1982).

Uca seismella (Figure 2a,b) CW 17.7, MC 22.5

Both sexes have a mottled brown carapace, grey-brown legs, and thin yellow eyestalks with bulbous eyes. Males have a pale, tear-shaped major claw with an orange-pink manus that may darken to purple and an orange patch on the underside. Juveniles are similar to adults.

Mating occurs outside female-occupied burrows and possibly within male burrows. Males have a frantic, 'flapping' wave which may be used to attract females and in territorial displays. Some individuals build intricate chimneys of mud-balls removed from the burrow.

Uca seismella are found in thick mud with regular tidal coverage, such as the steep muddy banks near the Ludmilla Creek boat ramp (Figure 1a), on the seaward edge of the *Sonneratia alba*/*Rhizophora stylosa* mangrove forest (Figure 1b), and near the Singapore observation post (Figure 1c).

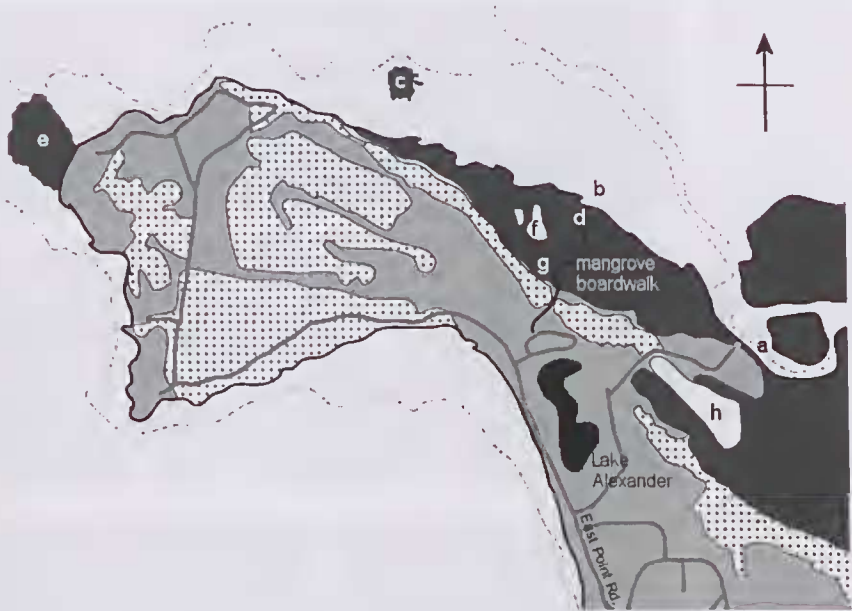
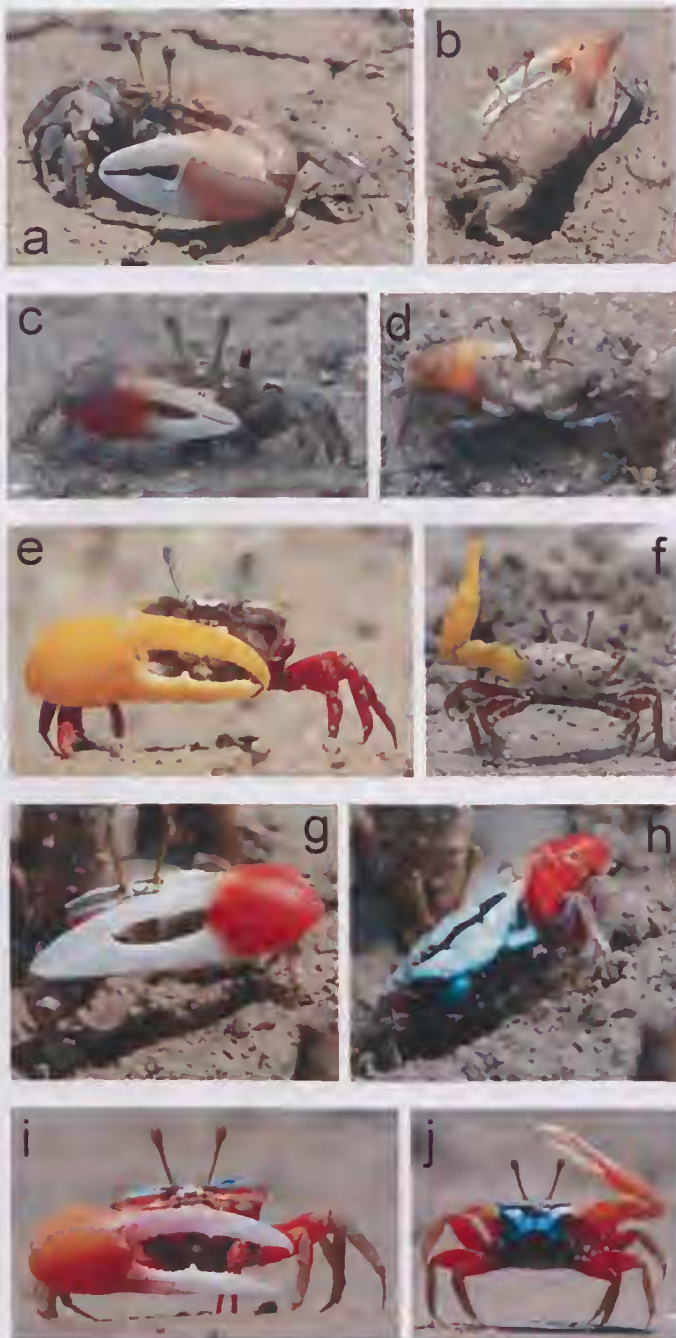


Figure 1. Map of East Point Reserve: species found in each location. The spotted areas represent monsoon forests, dark grey areas are mangrove forests, and light grey areas are grassed. Intertidal mudflats are delineated by dotted lines in the water.

(a) Steep banks of Ludmilla Creek near the boat ramp: *U. seismella*, *U. polita*, *U. capricornis*, *U. flammula*. (b) Seaward edge of the *Sonneratia alba*/*Rhizophora stylosa* forest below the mangrove boardwalk: *U. seismella*, *U. vomeris*, *U. polita*. (c) Open mudflats among the rock platforms surrounding the ruins of the Singapore observation post: *U. seismella*, *U. vomeris*, *U. polita*. (d) *S. alba*/*R. stylosa* forest at the end of the mangrove boardwalk: *U. hirsutimanus*, *U. capricornis*, *U. flammula*. (e) Stunted Grey Mangroves *Avicennia marina* on the tip of East Point: *U. mjoebergi*. (f) Small clearings among the Grey Mangrove forest near the mangrove boardwalk: *U. mjoebergi*, *U. signata*, *U. elegans*, *U. vomeris*, *U. capricornis*, *U. flammula*. (g) Path towards the mangrove boardwalk: *U. signata*. (h) Salt flat behind the Ludmilla Creek boat ramp: *U. elegans*.

Figure 2. Front (left panels) and back (right panels) views of males of the nine species of fiddler crab (*Uca*) found in Darwin.

(a,b) *U. seismella*;
 (c,d) *U. hirsutimanus*;
 (e,f) *U. mjoebergi*;
 (g,h) *U. signata*;
 (i,j) *U. elegans*;
 (k,l) *U. vomeris*;
 (m,n) *U. polita*;
 (o,p) *U. capricornis* adult and
 (q,r) *U. capricornis* final adult colour stage;
 (s,t) *U. flammula*.





Uca hirsutimanus (Figure 2c,d) CW 18.6

Both sexes have a mottled brown and white carapace, brown-grey legs, and stocky, dull yellow-green eyestalks. The male's major claw has an orange-red manus with a patch of purple-brown on the top edge, and white fingers with a single groove running along them. Juveniles are similar to adults.

The mating system of *U. hirsutimanus* is unknown although both sexes may build chimneys of surface mud.

Uca hirsutimanus inhabit soft mud in fairly sheltered sites. They can be found in the *S. alba*/R. *stylosa* forest at the end of the mangrove boardwalk (Figure 1d).

Uca mjobergi (Figure 2e,f) CW 16.4, MC 25.0

Both sexes and all ages have a mottled brown carapace, often with traces of yellow or red, and grey-brown eyestalks. The legs are striped muddy brown, red, or yellow. Males have a uniformly yellow major claw.

Around neap tide, when the population is not covered by the tide, males attract burrowless, wandering females by waving with a large beckoning motion, extending the claw laterally and raising it over the eyestalks before lowering it in front of the body. Mating occurs primarily within the male's burrow but also on the surface. Individuals of both sexes may build chimneys.

Uca mjobergi are found at elevated sites that are not covered by the tide for several days around neap tide. They occur on the tip of East Point (Figure 1e), in small clearings and along the landward edge of the Grey Mangroves *Avicennia marina* near the mangrove boardwalk (Figure 1f,g).

Uca signata (Figure 2g,h) CW 18.4, MC 21.0

Males have a black carapace with a pale blue to white 'X' marking and mustard yellow eyestalks. Females are mottled brown or white with an orange patch in the centre of the carapace. Both sexes have grey-brown or black legs, sometimes with traces of blue or red on the first segment of each. The male's major claw has an orange or red manus and bright white fingers with a single groove running along the lower finger, which also has a distinctive flat edge where the fingers meet. Juveniles have a mottled brown carapace, paler grey legs, and a paler manus.

Males wave at females with a quick jerky upward and outward movement accompanied by a small leap at the end. Males often build their burrows and wave on top of mounds of mud like those made by mud lobsters *Thalassina squamifera*. Mating generally occurs above ground although males may also herd females towards their burrow to mate.

Uca signata are found in areas that are infrequently covered by the tide. At East Point they can be seen in small clearings among the Grey Mangroves (Figure 1f) and along the higher areas of the mangrove boardwalk (Figure 1g).

Uca elegans (Figure 2i,j) CW 26.6

Males have a black carapace with a pale blue to white 'V' or 'X' pattern and occasional patches of orange at the edges. Females are speckled brown, sometimes with a cream-coloured cross. The male's major claw has a pale orange, red, or pink manus that fades to white over the long 'elegant' fingers. Both sexes have muddy orange-red legs and yellow-green eyestalks. Juveniles have less distinct white markings on their carapace and paler claws.

Males wave by raising their claw above their eyestalks in front of their bodies while facing away from wandering females, in an attempt to herd them back to their burrows to mate. Mating also takes place on the surface. Males sometimes build large chimney-like mounds around their burrow using mud from inside their burrow.

Uca elegans generally inhabit dry, open areas that are not inundated by the tide for long periods, during which time the crabs remain underground. Females often prefer more sheltered, damper habitat. At East Point they occur in small clearings in the Grey Mangroves near the mangrove boardwalk (Figure 1f) as well as in the salt flat near the Ludmilla Creek boat ramp (Figure 1h).

Uca vomeris (Figure 2k,l) CW 29.2, MC 41.5

Both sexes have a black carapace with a patch of blue, yellow, cream, or green near the base that extends over the entire carapace in larger individuals. They have bright orange or red legs and pale grey-blue or grey-green eyestalks. Males have a solid major claw with prominent teeth and two deep grooves at the base of the lower finger that are often filled with algae or mud. The lower half of the claw is dark orange or red fading to a paler pink, orange, or white on the top half. Juveniles have a mottled brown carapace, striped brown legs, brown eyestalks, and a paler, more uniformly coloured claw.

Males display a simple vertical wave in front of the body to above the eyestalks, which they use in territorial interactions and when trying to herd wandering females towards their burrows. Mating commonly occurs on the surface outside female burrows and possibly within male burrows.

Uca vomeris inhabit relatively open areas of soft mud that are regularly inundated by the tide. At East Point they can be seen near the Singapore observation post (Figure 1e) and at the edge of the *S. alba*/*R. stylosa* forest at the end of the mangrove boardwalk (Figure 1b).

Uca polita (Figure 2m,n) CW 26.2, MC 41.0

The carapace of both sexes is marbled yellow, green or cream, and occasionally orange or pink. They have dark brown or black legs with pink or blue patches and pale yellow-green eyestalks. Males have a bright pink or orange major claw fading to white on the fingers. Juveniles are similar, with a marbled brown carapace.

Males use a simple vertical wave in front of the body to above the eyestalks in territorial interactions and when courting females. Males form resident breeding units with one or two females (von Hagen 1993), and mating occurs on the surface outside the burrow of the female. Males may also attract wandering females to their burrows to mate.

Uca polita inhabit regularly inundated, open areas of deep and sticky mud and can be found among the rocky shelves near the Singapore observation post (Figure 1c), on the creek banks by the Ludmilla Creek boat ramp (Figure 1a) and at the edge of the *S. alba*/R. *stylosa* forest at the end of the mangrove boardwalk (Figure 1b).

Uca capricornis (Figure 2o,p,q,r) CW 32.3, MC 45.0

The carapaces of both sexes change from a uniform blue to white or mottled white and brown or black. Adults develop a pattern of distinct white, yellow, or blue patches on a black background, generally a triangular yellow patch behind the eyestalks and three white, yellow or blue spots. The largest individuals are entirely black and were previously described as a separate species, *U. pavo* (George & Jones 1982). However, the conclusion by von Hagen and Jones (1989) that they are in fact *U. capricornis* is supported by recent genetic analyses (S. Keogh, pers. comm.). The colour of their legs also progresses from entirely blue to black or grey with purple or blue tinges. Adult males have black legs with bright blue or whitish spots on the last pair while adult females often have spots on all of their walking legs or entirely blue or aqua legs. Males have a tear-shaped major claw with a yellow or orange manus fading to white on the fingers, the claw of mature males are cream coloured with fingers longer than the manus. Mature adults have yellow-green eyestalks and black eyes; all other stages have yellow eyestalks and red eyes.

Males have a very simple vertical wave directed at females and other males. Mating occurs on the surface, often between neighbouring male and female 'pairs' (Detto *et al.* 2008). Some juveniles of both sexes construct chimneys of mud collected from the surface.

Uca capricornis are found in shaded areas of thick mud that are regularly covered by the tide. They occur on the creek banks by the Ludmilla Creek boat ramp (Figure 1a), throughout the *S. alba*/R. *stylosa* forest and along the mangrove boardwalk (Figure 1d,f).

Uca flammula (Figure 2s,t) CW 39.6, MC 69.0

Both sexes have a black carapace often with a red-orange strip behind the eyestalks and two white or orange 'comma' markings in the centre. Their legs and eyestalks are bright red-orange. Males have a rough, tubercle-covered, bright red major claw, with orange to white fingers with prominent teeth. Juveniles have a white carapace which becomes a pale muddy grey colour. They have pale yellow claws and legs, and blue-black eyestalks.

Males direct a high vertical wave at females, and possibly also during territorial disputes with other males. Some juveniles of both sexes collect surface mud to construct chimneys. Mating takes place on the surface.

Uca flammula inhabit relatively open areas in soft mud and are most active at spring tide, particularly at high sites where they are left uncovered by the tide for long periods. They are found on the creek banks by the Ludmilla Creek boat ramp (Figure 1a), throughout the *S. alba*/*R. stylosa* forest and along the mangrove boardwalk (Figure 1d,f).

Watching fiddler crabs

The best time to view fiddler crabs is generally 3 hours before, to 3 hours after the diurnal low tide. However, during neap tides, populations that are not inundated can often be observed throughout the day. Fiddler crabs are easy to locate, by the presence of their small (<3 cm wide), circular burrows. They are very sensitive to movement and will retreat to their burrows when approached. However, they will emerge within 5-10 minutes and behave normally within metres of a completely motionless observer. With the exception of *U. mjobergi*, who mate during neap tide, mating and waving behaviour is most common around spring tide. Fiddler crabs are charismatic and very interesting to watch, and this guide should facilitate the observation of the fiddler crabs around Darwin.

References

- Crane J. (1975) *Fiddler Crabs of the World* (Ocypodidae: genus *Uca*). Princeton University Press, New Jersey.
- Detto T., Hemmi J. and Backwell P.R.Y. (2008) Colouration and colour changes of the fiddler crab, *Uca capricornis*: a descriptive study. *Public Library of Science One* (online) 3(2) e1629, 1-10. doi:10.1371/journal.pone.0001629.
- George R.W. and Jones D.S. (1982) A revision of the fiddler crabs of Australia (Ocypodidae: *Uca*). *Records of the Western Australian Museum Supplement* No. 14, 1-99.
- von Hagen H.-O. (1993) Waving display in females of *Uca polita* and other Australian fiddler crabs. *Ethology* 93, 3-20.
- von Hagen H.-O. and Jones D.S. (1989) The fiddler crabs (Ocypodidae: *Uca*) of Darwin, Northern Territory, Australia. *The Beagle, Records of the Northern Territory Museum of Arts and Sciences* 6, 55-68.
-